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ABSTRACT

This epidemiological study investigates the question of whether there are sex-race group differences in factors responsible for school achievement in the early grades. Approximately 350 children enrolled in 18 schools were measured at the beginning of kindergarten and end of the 3rd grade for cognitive ability, social-emotional characteristics and school achievement. When the sex-race groups were examined separately, it was found that the white female group performed best at the end of the 3rd grade in all areas. Performance levels decreased in this order: white females, white males, black females, black males. Results of correlational and multiple regression analyses reported in this study indicate several differences among the sex-race groups. Cognitive ability appears to account for more of the variance in reading achievement for whites than for blacks. Home background and other factors measured at kindergarten entrance are related to achievement, ability and social maturity at the end of 3rd grade only for the white males. Implications of the findings for theory of school achievement and for research are presented. The relation of school achievement to later health differences among the groups studied is also discussed. The advisability of separate sex-race group analysis before making conclusions for the total group is indicated. (Author/RH)

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AN EPIDEMIOLOGICAL STUDY OF SCHOOL ACHIEVEMENT: IMPLICATIONS FOR THEORY AND RESEARCH.

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Epidemiologists have frequently described their discipline as an approach to problems as well as a body of knowledge (Lilienfield, 1978, and Omran, 1969, are examples). The basis of epidemiology and its approach is sometimes said to rest upon the proposition that death and disease do not occur at random in populations, and that the patterns actually existing in these occurrences cast light upon the factors responsible for the death and disease. A small amount of theory, not yet well formulated, at times guides a study in its beginning stages, and undergoes a great deal of development and clarification in the process of the epidemiological research. At a mid-stage, it frequently happens that the investigation serves to identify populations at risk for the illness in question.

The failure of many children to achieve in school at acceptable levels has come to be regarded as an illness of epidemic proportions, and on that basis the epidemiological approach is appropriate. In point of fact, the approach was adopted more or less as a matter of course in the first phase of the present research because the topic was a typical one for epidemiology: possible links between school achievement differences and actual mortality and morbidity rates for the separate sex-race groups in the population. The findings of that investigation have been reported in earlier articles (Landsberger, 1978 and 1979), and they are to be summarized briefly here. In the second phase of the research, the study reported in this paper, we have gone on to investigate differences among the sex-race groups with respect to factors related to achievement in school. As suggested above, the findings have indeed led to the formulation of a theoretical model, albeit in preliminary form, for the explanation of differences in early school achievement. This,

together with implications for research suggested by the findings, is to be presented toward the end of this article. It is appropriate here to look at the findings, beginning with a summary of these regarding levels of achievement and moving on to those dealing with sex-race group differences in factors associated with achievement.

Differences in levels of achievement

Differences among the sex-race groups' achievement at the primary school level were investigated in data from a sample of approximately 350 children enrolled in a network of 18 schools where an early childhood education program was being introduced into the public school system of the state. Measurements were made for the children at the beginning and end of the primary school years for cognitive ability, social-emotional characteristics and for school achievement. When the sex-race groups were examined separately, it was found that the white female group performed better at the end of the third grade in all of these areas than any of the others. White males, who were slightly ahead of females at the start, showed a relative drop in performance levels during this period. Among white children, girls' scores on achievement tests and the social maturity scale were significantly higher than boys' at the end of third grade.

Black children of both sexes performed at lower levels in all achievement areas than whites, with black males at the bottom of the four groups in all achievement tests and on the cognitive ability measure. Nevertheless, blacks of both sexes improved slightly in percentile terms during the four primary school years, and on the social-emotional measure of "school-affiliation" blacks scored higher than white males.

The purpose of that study was to examine differences in the quality of school experience as one cause possibly contributing to the higher mortality rates and lower life expectancy of males vs. females, non-whites vs. whites, and poor vs. non-poor. The stress involved for children who do less well than others in school from the very beginning is theoretically a basis for viewing school experience as one cause among others which accounts for the poorer health outcomes of white and non-white males, and of non-white females, as all three compare with white females, and of poor compared with non-poor of each group.

Differences in factors associated with achievement

It is the next step of the research, the findings regarding the sex-race group differences in factors associated with achievement, which constitutes the material to be reported here. Various investigations have reported results which suggest that the groups might differ with respect to these associations. A large group of studies in the sociological literature often referred to as the "educational attainment" studies have looked at achievement differences at the secondary school level. Several of these have reported that factors associated with achievement and ambition in one sex-race group are not found in others. Specifically, influence of home background has been found to be related to achievement in the case of white males, but not black males. Ability measures also were related strongly to achievement only for whites. Furthermore, greater differences in associations of variables with achievement between the sexes existed for whites than for blacks in the findings of DeBord, Griffin and Clark (1977).

The data were analyzed in the present study for the sex-race groups separately to see whether with these younger children there would also be

different patterns of association between and among variables for the different groups. The survey of studies entitled "Sex role and pupil role" published by Lee and Voivodas (1977) and the longitudinal research reported by Martin Kohn (1977) contain material suggesting that the confrontation with school is an experience with profound differences according to children's membership in their particular sex-race groups. We planned our analyses with this as the question: do children of some groups "make it" at school on intellectual ability alone, while for others, social behavior appears to be as important or more important than intellectual ability? We expected a positive answer, given our findings that the results of school experience differ from the sex-race groups as they have in the case of this sample -- some learning more and others less, some being more socially mature than others -- and, given the findings of previous studies referred to above.

A complete report of the analyses is available from the author for those who need and want to examine the results of the correlations analyses and the multiple regression analyses which were performed withthe data for the beginning of kindergarten and end of third grade for this sample of approximately three hundred fifty children. Several measures, including cognitive ability, achievement and social-emotional variables, were made at both kindergarten and third grade levels. Home environment advantage was measured at kindergarten and third grade levels. The volume of data is large enough to make presentation a problem. It is appropriate to present here only a summarization of the analyses. The cross-sectional view of association of various factors with achievement at the end of third grade is presented first. Next we will examine the view over time -- association between factors measured at the start of kindergarten

to third grade achievement and the other factors measured at that time.

The cross-sectional view at the end of third grade

The performances on five achievement tests of the Iowa Test of Basic Skills at the end of third grade were analyzed in relation to scores for the cognitive ability measure used at that time -- the Cognitive Abilities Test -- and three scales from a paper-pencil test, the Self-Observation Scales, for social-emotional variables: Self-Acceptance, Social Maturity and School Affiliation. Pearson product-moment correlations (r's) were obtained for these associations for the total group of subjects for whom the complete data existed (approximately 470), and for each sex-race group separately. These correlations are presented in Table 1.

--- Table 1 goes about here ---

Predictably, there are correlations between the ability measure and the achievement tests which are highly positive. The r's for white boys and white girls are almost all in the 50's and 60's. Taking one important case, for Reading this r is .65 for the total group, the white boys and the white girls, indicating that in each case, the cognitive ability measure can be said to account for 40% of the variance in Reading achievement. Though the r's for the ability measure with achievement tests were generally high for black girls, the r's for black boys were lower in every case excepting "Spelling." (Conversely, for black girls, Spelling is the only instance of a non-significant correlation between ability and achievement.) To look at Reading alone for blacks, the correlations indicated that for black girls, the cognitive ability measure can be said to account for 30% of the variance in Reading achievement, and for black boys, 26%. Thus the associations for both sexes of black children

TABLE 1. Pearson product-moment correlations at the third-grade level for ability and social-emotional variables with performance on five tests of achievement, for total group and for separate sex-race groups.

Note: Correlations are significant $\leq$ .01 level excepting those marked *, significant $\leq$ .05 level of NS, not significant.

TOTAL GROUP N = 470

Achievement Tests	Cognitive Abilities Test (C.A.T.)	Social Emotional (S.O.S. Scales) Self Acceptance	Social Maturity	School Affil'n
Vocabulary	.67	.22	.40	.05NS
Reading	.65	.21	.40	.05NS
Spelling	.40	.15	.27	.10*
Math Concepts	.72	.19	.40	.04NS
Math Problems	.50	.11*	.34	.05NS

BOYS N, White = 143; N, Black = 73

	White	Black	White	Black	White	Black	White	Black
Vocabulary	.64	.56	.25	.09NS	.20*	.30	-.05NS	.04NS
Reading	.65	.51	.21	.12NS	.19*	.32	-.06NS	.02NS
Spelling	.49	.25	.16	.23*	.10NS	.35	-.05NS	.21NS
Math. Conc.	.72	.54	.20*	.05NS	.29	.40	-.02NS	.11NS
Math. Probl.	.57	.16NS	.10NS	.07NS	.19*	.36	-.09NS	.17NS

GIRLS N, White - 147; N, Black = 100

	White	Black	White	Black	White	Black	White	Black
Vocabulary	.64	.57	.29	.20*	.44	.36	.24	.15NS
Reading	.65	.55	.28	.18NS	.44	.30	.27	.05NS
Spelling	.42	.17NS	.14NS	.11NS	.28	.04NS	.21	.09NS
Math. Conc.	.61	.62	.25	.22*	.38	.36	.21	.18NS
Math. Problm.	.43	.45	.16*	.12NS	.29	.32	.21	.15NS

are smaller than the whites' figure of 40%.

The correlations of social-emotional variables with achievement were generally smaller than were those of cognitive ability with achievement. However, there were many significant correlations and several r's as high as .40 or above. There did appear to be differences by sex-race groups in whether or not these scales were correlated with achievement. To locate possible differences among the groups in patterns of association of these variables and cognitive ability with achievement was of course the purpose in making these analyses. They appeared to be these:

1. Among the white girls, both cognitive ability and all of the social-emotional variables had strong associations with achievement in all five subject areas covered by these tests.

2. For white boys, the r's between achievement and these social-emotional variables were much smaller than white girls'. For them, the strong associations were between achievement and the cognitive ability measure. Not only were the r's with social-emotional scales small and many not significant, but with the School Affiliation scale, all r's actually had a negative sign.

3. Among black boys, the r's between cognitive ability and achievement tests were lower than among whites. On the social-emotional measure of Social Maturity, virtually all of the r's were large enough to be significant, and this was true for girls as well as boys. A weak association seemed to exist for both sexes of blacks between Self-Acceptance and achievement test performance. The association between achievement and School Affiliation, while also weak, was always positive.

When the measuring of all variables is done with paper-pencil tests and the subjects are no older than third-graders, it is likely that all test performances are dependent upon the same kind of test-taking ability, and that the measures are not as independent as the researcher might wish. For this reason, a multiple regression analysis was performed with the same data as the correlational analysis just described. The Multiple R indicates the common variance of dependent variable with all independent variables in the equation. The correlation coefficient

for Cognitive Ability entered in the first step of the analysis, together with the partial correlations yielded for each of the social-emotional scales, indicate the independent association of each of those with variation in achievement.

TABLE 2. Results from multiple regression analysis of achievement test performance at end of third grade by sex-race groups separately.

Sex-Race Group	Total variance in achievement (Vocabulary, Reading and Math Concept subtests combined) accounted for by cognitive ability test and social-emotional variables	Variance with cognitive ability measure alone (entered in first step)
White boys	49% (MR = .70)	44% (R = .66)
White girls	41% (MR = .64)	38% (R = .62)
Black girls	38% (MR = .62)	34% (R = .58)
Black boys	36% (MR = .60)	28% (R = .53)

For all sex-race groups these were high, and there were similar correlations with the three tests of vocabulary, reading and math concepts. To present this information, the variance accounted for by all together is shown along with the variance accounted for by the cognitive ability measure alone; these figures are given for each sex-race group separately in the table above.

Differences according to sex-race group in the end-of-third-grade patterns are evident in the data presented in Table 2. Black boys were the group with less achievement associated with the cognitive ability measure. The findings for significant partial correlations for the remaining variables, the social-emotional scales, are interesting when

viewed together with that fact. Black boys were the only sex-race group with a substantial number of significant correlations. For the three social-emotional scales and the five achievement tests, 8 of the 15 partial correlations were significant. For white girls, 3 of these 15 were significant, while not a single one of the partial correlations was significant for white boys nor for black girls. (As noted above, in the case of one social-emotional scale, negative signs appeared in the small correlations for white boys.)

To sum up what the two kinds of analyses of data from the one point in time -- end of third grade -- have told us about differences in the sex-race groups:

1. White boys are the group where the cognitive ability measure was closely associated with achievement and where the weakest associations of the social-emotional measures appeared.

2. The same situation seemed true for black girls, though the relations with the cognitive ability measure was not as strong as for white boys.

3. White girls were the group with significantly strong associations of social-emotional variables and of cognitive ability with achievement.

4. For black boys, there was least association between cognitive ability and achievement, but indication that social-emotional variables were associated with achievement measures in all school subject areas.

The longitudinal view.

It is also interesting, and possibly even more useful, to look at this same question with data which covers a period of time. Are there differences in the sex-race groups in the relationships between third-grade achievement and characteristics measured at the point of their entrance into kindergarten?

For this same sample of children, variables of several kinds were measured at the point of kindergarten entrance. They included educational

advantage in the home environment, measured by the HIS scale; intellectual ability, measured by tne Cooperative (Caldwell) Preschool Inventory and the Peabody Picture Vocabulary Test; and social-emotional factors -- Extraversion-Introversion, Social Behavior and Task Orientation-- measured by teacher ratings, using the Schaefer-Aaronson Classroom Behavior Inventory.

These measures were related by correlational and multiple regression analyses with various combinations of the achievement tests, the ability measure and the social-emotional scales from the end-of-third-grade measurements, identified in the preceding section of this paper.

Home environment advantage and third-grade achievement, cognitive ability and social maturity.

These relationships were assessed by means of the correlations analysis performed on the basis of the Home Information Scale (HIS)[1], a quantitative measure of educational advantage in the kindergarteners' home environment, and the Cognitive Abilities Test, Social Maturity Scale, and the following achievement tests from the Iowa Test of Basic Skills: Vocabulary, Reading, Spelling and Math Concepts.

The comparisons in Table 3 make it clear that only for white boys is there the consistent and significant relationship between kindergarten-level home environment advantage and the third-grade variables which appears when the data for the total group are analyzed together. For the other sex-race groups this association is virtually non-existent by comparison with the case of white boys.

TABLE 3. Pearson product-moment correlations between the kindergarten-entrance measure of home environment advantage and third-grade achievement, cognitive ability and social maturity: total group and sex-race groups separately.

NOTE: only significant correlations are given. An asterisk indicates significance at the .05 level; others are significantly $\leq$ .01 level.

		THIRD GRADE VARIABLES					
		ACHIEVEMENT TESTS				COGNITIVE	SOCIAL
GROUP	N	VOCABULARY	READING	SPELLING	MATH	ABILITY	MATURITY
Total Group	355	.39	.37	.23	.33	.46	.26
White Male	105	.37	.43	.35	.36	.36	.19*
White Female	110	-	-	-	.27	.27	-
Black Male	60	.28*	-	-	-	-	-
Black Female	80	-	-	-	.27	.27	.36

Relationships of kindergarten cognitive ability and third-grade ability, social maturity and achievement. Correlations were obtained to indicate relationships between those same third-grade variables and cognitive ability at kindergarten entrance as measured by the Peabody Picture Vocabulary Test. These correlations are compared for the sex-race groups with each other and the group as a whole in Table 4.

TABLE 4. Pearson product-moment correlations between cognitive ability at kindergarten entrance as measured by Peabody Picture Vocabulary Test and third-grade achievement, cognitive ability and social maturity, total group and sex-race groups separately.

NOTE: Only significant correlations are given. An asterisk indicates significance $\leq$ .05 level; others are significantly $\leq$ .01 level.

THIRD GRADE VARIABLES

GROUP	N	ACHIEVEMENT TESTS				COGNITIVE ABILITY	SOCIAL MATURITY
		VOCABULARY	READING	SPELLING	MATH		
Total Group	355	.44	.40	.24	.38	.62	.33
White Male	105	.28	.24*	.29	.33	.44	.28
White Female	110	.39	.34	.20*	.20*	.51	-
Black Male	60	.26*	.25*	-	-	.47	-
Black Female	80	.26*	-	-	-	.50	.38

With respect to the relationship of kindergarten cognitive ability and third-grade performance, the white of both sexes follow fairly closely the kind of relationship which was indicated when data for the total group were analyzed together. However, the relationships for blacks of both sexes are much less consistent and strong, especially with the achievement tests. For black children, the kindergarten measure of ability was closely correlated with the third-grade ability measure.

The Multiple Regression Analysis was performed using the Peabody test for the kindergarten cognitive ability measure, and at third-grade level only two achievement tests, the cognitive ability measure and the

social maturity scale. The achievement tests were Reading and Math Concepts. Results from that analysis indicated highly significant relationships of the Peabody with all third-grade measures for the total group, but highly significant relationships in the case of sex-race groups separately only for the third-grade cognitive ability measure. In every sex-race group these latter were correlated significantly, usually beyond the .001 level. As for the two achievement tests, the only significant relationships with the kindergarten Peabody measure were with the Math Concepts for white boys, and with Reading for white girls. There were no significant correlations of the Peabody with achievement tests for blacks of either sex.

Relationships between the kindergarten social-emotional factor of Extraversion and third-grade ability, social maturity and achievement. Correlations between the scores for this factor at kindergarten entrance and the third-grade measures for the total group data are smaller than those of the kindergarten cognitive ability measure, but they are all highly significant ones. These are presented together with the correlations for the sex-race groups separately in Table 5.

In the separate sex-race groups, Extraversion at kindergarten seems to be associated with third-grade performance for all of the groups only for cognitive ability, and for almost all groups for social maturity. The only correlations with an achievement test large enough to be significant at the .01 level is the r of .30 between Reading and Extraversion for black males.

TABLE 5. Pearson product-moment correlations between the social-emotional factor of Extraversion at kindergarten entrance as measured by the Schaefer-Aaronson Classroom Behavior Inventory and third-grade achievement, cognitive ability and social maturity, for total group and sex-race groups separately.

NOTE: Only significant correlations are given. An asterisk indicates significance $\leq$ .05 level, others are significantly $\leq$ .01 level.

		THIRD GRADE VARIABLES					
		ACHIEVEMENT TESTS				COGNITIVE	SOCIAL
GROUP	N	VOCABULARY	READING	SPELLING	MATH	ABILITY	MATURITY
Total Group	355	.28	.28	.18	.25	.39	.23
White Male	105	.19*	-	-	.22*	.22*	.20*
White Female	110	-	-	-	-	.34	.21*
Black Male	60	-	.30	-	-	.43	-
Black Female	80	.21*	-	-	-	.21*	.24

Results of the regression analysis show significant partial correlations for the Extraversion factor with the two achievement tests sued in that analysis, Reading and Math, as well as with cognitive ability and social maturity for the total group data. In that analysis, there were no significant correlations between kindergarten Extraversion and any third-grade measure for white males and none for black females. For white females and for black males, the relationships found in the correlational analysis were confirmed: Extraversion was significantly related to cognitive ability for both groups, to social maturity for white females, and to Reading for black males.

Relationships between the kindergarten social-emotional factor of Task Orientation and third-grade ability, social maturity and achievement.

The correlations of this factor at kindergarten with all third-grade measures are almost identical with those for Extraversion when data for the group as a whole were examined. However, the sex-race group differences are strinkingly different when it comes to these two factors. The correlations with Task Orientation for the total group and the sex-race groups separately appear in Table 6.

TABLE 6. Pearson product-moment correlations between the social-emotional factor of Task Orientation at kindergarten entrance as measured by the Schaefer-Aaronson Classroom Behavior Inventory and third-grade achievement, cognitive ability and social maturity, for total group and sex-race groups separately.

NOTE: Only significant correlations are given. An asterisk indicates significance $\leq .05$ level; others are significantly $\leq .01$ level.

		THIRD GRADE VARIABLES					
		ACHIEVEMENT TESTS				COGNITIVE	SOCIAL
GROUP	N	VOCABULARY	READING	SPELLING	MATH	ABILITY	MATURITY
Total Group	355	.28	.28	.18	.25	.39	.23
White Male	105	.19*	-	-	.22*	.22*	.20*
White Female	110	-	-	-	-	.34	.21*
Black Male	60	-	.30	-	-	.43	-
Black Female	80	.21*	-	-	-	.21*	.24

The multiple regression analysis, again using only Reading and Math Concepts as achievement tests, produced confirmation of the picture presented in the Table 6 correlations as far as the black children were concerned. Task Orientation proved significantly related to everything

for black girls and to nothing for black boys. For white girls, Task Orientation was only related significantly to the ability measure, not to achievement. For white boys, Task Orientation was very significantly related to cognitive ability and to social maturity, but the partial correlations with the achievement tests were not large enough to be significant.

Discussion of sex-race group differences.

It is difficult to avoid the tendency to attribute cause when relationships between and among variables are discussed. This is especially the case in relation to school achievement, where parents, legislators, educators and the public at large are all searching for ways to improve children's learning at school.

The associations of other variables with school achievement examined here cross-sectionally -- at third grade only -- cannot be said to indicate causation at all: it is as defensible to say that spelling achievement brings about increased cognitive ability as to make the oppositie statement. The relationship to third-grade achievement of variables measured at kindergarten are different, because the latter came earlier. Even there, however, the obvious complexity of causation of school achievement calls for a cautious approach to any reflection upon the findings.

Our fundamental purpose in any case is to describe the different patterns among these variables existing for the different sex-race groups. The existence of differences is viewed as evidence that the confrontation of children and school is experienced and responded to differently according to sex-race group membership. We propose that in

complex ways these differences are related to differences in educational outcomes for the groups, and all of this is related in its turn in even more complex ways to differences in health status existing among the sex-race groups.

The findings of this particular study together with the groups' performance differences reported in the earlier article can be presented in the form of brief descriptions of each of the sex-race groups.

White females appear to be helped to meet the challenge of school by both cognitive ability and social-emotional characteristics: both are related to their school achievement. If we may consider the school affiliation scale at third-grade as an indicator, it is white girls who make the highest scores on this factor. Achieving at school begins at a high level relative to the total group of children, and it continues to rise during the first years of school. School appears to be the white girls' "cup of tea."

White males begin kindergarten with performances a little above the white girls' level, but they score below females at the end of third grade. Furthermore, their scores for school affiliation are at the bottom of the four sex-race groups. A lack of affiliation with school may well be related to the fact that for white males, two kinds of advantage with which children begin school -- cognitive ability and home environment advantage -- continue to be related to achievement differences at the end of third grade. White males are the only sex-race group for whom home environment advantage is related very significantly to achievement, and the group for whom the kindergarten measure of cognitive ability was significantly and consistently related to all third-grade performance. Still another kindergarten-entrance measurement was related significantly

to third-grade performance for white boys, and this was the factor of Task Orientation. It is as though white boys continue to draw upon resources with which they begin school, but perhaps do not add new supports at school as the white girls do.

For black children of both sexes, not only is there no relationship between home environment advantage and achievement, but ability measures play a relatively weak role in determining achievement levels. Our analyses indicated that for black boys, school affiliation and social maturity are two factors which do accompany differences in achievement. There are similarities in the school experiences of black boys and white girls with respect to significant relationships at the third-grade level between achievement and social-emotional factors. However, there is an important difference: for white girls, this relationship of achievement to social-emotional factors is accompanied by a sturdy relationship of achievement and cognitive ability. When performances at the beginning of kindergarten for black boys were related to third-grade achievement, the only significant relationships were with a social-emotional factor: Extraversion. It is notable that for black males, the children at highest risk for failure at school, ability differences were found to have little relationship to differences in achievement.

Among black girls, it was Task Orientation at kindergarten entrance with which there were highly significant relationships to third-grade achievement and to other characteristics: cognitive ability and social maturity. School affiliation was high for black girls, but not significantly related to achievement in any subject-matter area; of the third-grade social-emotional scales, only Social Maturity was significantly related to achievement. Finally, the achievement of black girls, somewhat higher

in all areas than black boys', was accompanied by a stronger relationship to ability measures than was the black boys' achievement.

Theoretical implications of this study.

Our findings from the study of the separate sex-race groups in relation to different levels of achievement and different factors related to school achievement has led to the formulation of a theoretical model for the explanation of differences in early school achievement. This model is presented in Figure 1. Its purpose is to organize the findings of this research in a form consistent with the findings from the educational attainment studies of achievement at secondary school levels previously cited, and with the theoretical approach formulated by Martin Kohn (1977) on the basis of his research with children at the early elementary school level.

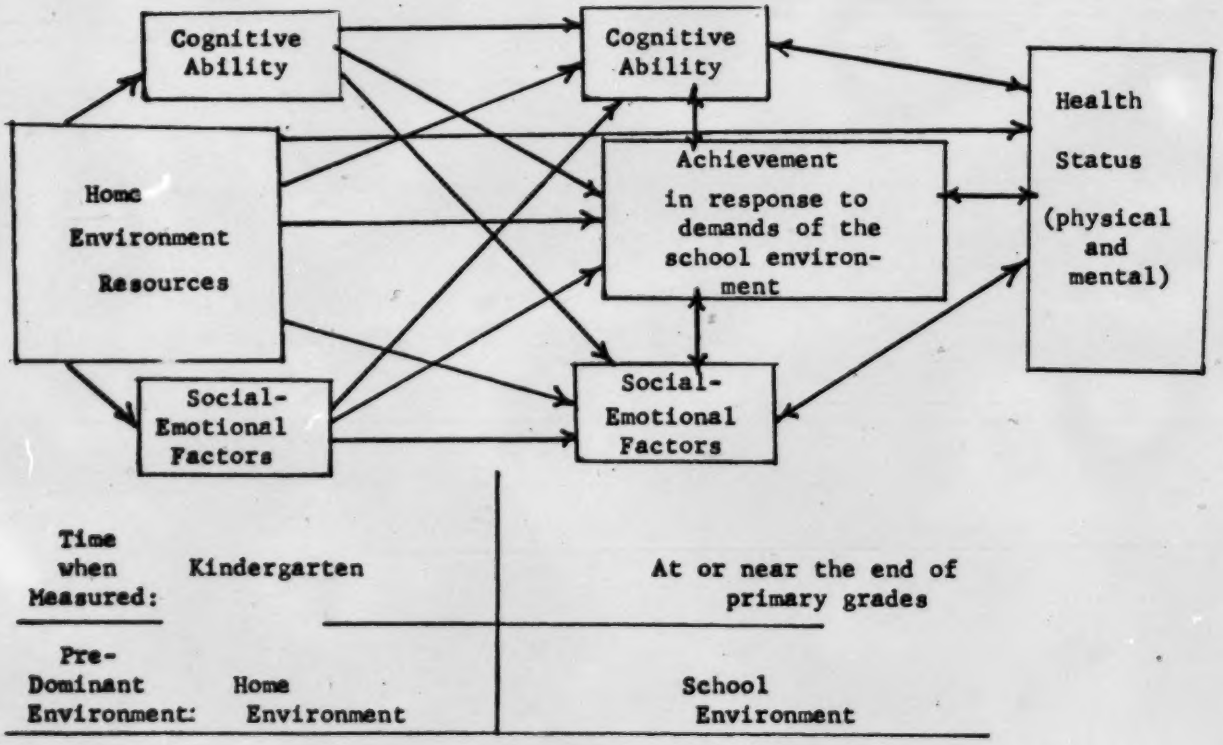

FIGURE 1. Theoretical model of relationships of measurable factors to achievement and health status at the primary school level.

A few statements might be made with respect to the points in the diagram. In the ongoing interaction situation of these first years of school, individuals make an adequate response to that environment -- that is, they achieve at the tasks and behavioral demands at school -- by drawing on both social-emotional and intellectual resources available to them at that time. As is indicated in the middle of the diagram by the two-way arrows between achievement at primary grade tasks and cognitive ability, on the one hand, and social-emotional factors on the other, there is mutual reinforcement. One aspect of the "adequate response" to school, or successful achievement, is that it represents positive feed-back and serves to renew the individual's resources for maintaining and possibly raising future achievement. Unsatisfactory achievement is negative feed-back which does not renew the resources, and consequently, achievement levels must be expected to decline. The health status of the individual, both physical and mental, is affected by and itself affects the totality, including of course, achievement itself.

The pattern of relationships between achievement and the "resources" unique to each sex-race group manifests a particular aspects of the process which can and does occur. Sometimes, "a particular distortion" is a more appropriate phrase. The white male pattern will be examined first.

White boys' third-grade achievement and their cognitive ability scores rested upon the status of kindergarten-entrance variables, where the predominant environment was the home, much more than did those of other sex-race groups. Achievement in third-grade was supported strongly by concurrent cognitive ability level, but unrelated to the concurrent social-emotional variables. This may well account for the fact that their achievement was lower -- in fact, it was significantly lower -- than

white girls, despite the fact that their cognitive ability level was the highest of the four groups. In our previous report of this research mention was made of existing evidence of poorer health outcomes for males vs. females among whites as well as non-whites, at the childhood as well as the adult level.

The fact that black boys' achievement in all subject areas was lowest and their health outcomes poorest may be seen as testimony to the importance of relationships between achievement and the third-grade level cognitive ability measure. In the black boys' pattern we note that this relationship was weakest, and that social-emotional variables, like social maturity, in a sense "filled the gap." Those factors were found to be much more often significantly related to achievement for black boys than for any other sex-race group. To depend at school very heavily upon social-emotional factors would appear, however, to be "expensive." Reports from various studies of the health status of children have furnished evidence as to black males' higher stress levels, more frequent psychological problems and, that black boys as well as black men have more than their share of problems of physical health (Landsberger, 1978).

While subject to the same stresses of minority group membership, black females have a much better health record than black males, and better at most age brackets in terms of mortality rates than white males as well. At the early school level we have seen that black girls are spared the black males' handicap of the very low relationship between cognitive ability and achievement. Furthermore, their achievement levels, while lower than whites, were not at the bottom. It was black males who were there. This may well have provided somewhat better feed-back to their resource systems and prevented some of the stress to which their male counterparts appeared to be subject.

It is the white girls' pattern which exemplifies the functioning of the model when a satisfactory level of achievement occurs and produces positive feed-back as well as the most desirable health outcomes at the child as well as the adult level. We have noted that in their case, achievement was in fact related closely both to cognitive ability and to the social-emotional factors as both are measured at third-grade level. Relative to white boys, there was little influence upon white females' achievement from the home environment resources and beginning-kindergarten social-emotion factors. It is proposed that the relationship of home-related factors measured at kindergarten entrance decrease as the school-related factors -- school affiliation, for example -- are developed. The positive impact of their relatively high achievement upon the white females' social-emotional status and their health indicators has been noted. To describe their response as one of meeting the demands at school and thus achieving an equilibrium there is consistent, we believe, with Martin Kohn's concept of "social competence" and its role in the prevention of under-achievement and emotional disturbance during the early school years.

Earl S. Schaefer (1975) whose formulations have been drawn upon by Kohn as well as in the present study, does include the negative category in the factors in his theoretical scheme -- there is introversion as well as extraversion, negative social behavior as well as positive, and so on -- but neither Schaefer nor Kohn depends upon negative factors alone for the explanation of children's response to school. This is counter to the approach of many theoretical schemes and much clinical work where children's adjustment to school is assessed by measuring the presence or absence of problems or symptoms. A more "absence of the negative" is not adequate explanation, in the view of Schaefer and of Kohn. They propose important

functions for positive factors to which they have given names like social competence, task orientation and extraversion. It seems to the present author especially necessary to include the positive aspects of factors studied in order to explain both health and school achievement outcomes, and we believe our findings have demonstrated this.

As Kohn has described for his sample in his book (1977), we have seen in this study the complexity of relationships of several factors to school achievement. It does not seem tenable in the face of such findings to approach the subject by putting much emphasis on a single factor, as Jensen, for example, has put upon intellectual ability (1969). The demonstrated complexity and variation among the different groups should also give pause to the educators who seem frequently to rush to explain school achievement outcomes on "the quality of the child's home." The variety in relationship of factors with their responses to school which we have observed in the different sex-race groups seems to call for attempts to develop more adequate explanations.

A further word might be added about the employment of the epidemiological approach to the matter of school achievement. It allows for the study of variations in the human condition and response capacity which is often noted when we study individuals, but there is hesitation about generalizing from the case of one individual. When these variations are brought to our attention by a whole population group, the effect of the phenomenon is somehow more convincing. (Whether it should be so or not is another question. The fact that it is so simply a part of scientific study.)

Implications of the study for research.

The point was made earlier in the article that insofar as the quality of school experience is found to differ for the different sex-race

groups, it is an error to generalize from an association found from an analysis for the total group, or for one sub-group, to other sub-groups.

The data from correlational analysis is presented throughout this article have shown that it was in fact true that even when highly significant, an association between variables established in the analysis of data for the group taken as a whole almost never existed for all of the sex-race groups taken separately. There were a very few instances where an association was established for one sex-race group only but did not exist for the other three sex-race groups nor for the total group analysis.

The findings from this study regarding the limited relationship of home environment advantage and school achievement are particularly worthy of note. The highly significant correlations between the Home Information Scale for the group as a whole and all measures at third-grade level simply indicate again the pervasive influence of the richness or poverty of the home environment upon achievement and intellectual ability which has been found in scores of studies on both sides of the Atlantic. In this study, as in some of the studies of educational attainement (DeBord, Griffin and Clark, 1977, for example), this same strong association was found also to exist for white males, but infrequently with the other sex-race groups. For white females the only correlations of home environment significant at the .01 level was with the third grade cognitive ability measure. For black females, the only similarly significant correlation was with cognitive ability and social maturity. For black males, there were correlations significant at the .05 level with two achievement tests only. The educator who "explains" disappointing pupil performance by referring to the determining influence of the socio-economic level of the

home is a common phenomenon, frequently quoted in newspapers. Findings of this research suggest that the educator is correct in the case of white boys, but mistaken in the case of the other sex-race groups.

An equally important group of findings related to the question of racial differences in school achievement due to racial differences in intellectual ability, a topic addressed in the writings of Jensen (1969) and others. As the data in Table 2 have shown, the cognitive ability measures accounted for more variance in achievement for whites than for blacks, and accounted for considerably less in the case of black males than black females. The importance to discussions of school achievement of whether or not differences in intellectual ability are to a greater or lesser extent genetically determined is diminished for the sex-race groups for whom school achievement has relatively little relationship with intellectual ability.

It is unusual rather than usual to encounter educational research reports where there are separate analyses for the sex-race groups. As in the case of Baughman and Dahlstrom (1968) or of Martin Kohn's work and several of the educational attainment studies previously cited, where there have been analyses of this kind, distinct differences in the sex-race groups have been found. It would appear from the findings of the present research and these other studies that it is essential that the groups be examined and analyzed separately before generalizing from the total group, or one single group, to others, regarding factors involved in school achievement.

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